

NWS FORM E-5 COMMERCE	U.S. DEPARTMENT OF	HSA OFFICE: San Juan, PR (SJU)
SERVICE	NOAA, NATIONAL WEATHER	REPORT FOR (MONTH / YEAR): July, 2004
MONTHLY REPORT OF RIVER AND FLOOD CONDITIONS		DATE: August 9, 2004
TO: NATIONAL WEATHER SERVICE HYDROMETEOROLOGICAL INFO CENTER, W/OS31 SSMC 2 – Room 13468 1325 EAST-WEST HIGHWAY SILVER SPRING, MD 20910-3283		SIGNATURE: Peter Corrigan
When no flooding occurs, include miscellaneous river conditions, such as significant rises, record low stages, ice conditions, snow cover, droughts, and hydrologic products issued (WSOM E-41).		

Summary: July precipitation was again higher than normal in Puerto Rico, for the third consecutive month. Preliminary data from San Juan ASOS showed July rainfall at 6.78" or 2.62" higher than the 1971-2000 normal of 4.16". The precipitation pattern featured repeated convection over the west and northwest sections of Puerto Rico, with monthly totals in excess of 10 inches over a broad area from San German north through Moca. From 12 to 16 inches of rain fell over portions of this area during the month, according to Southeast River Forecast Center estimates. Despite the pockets of heavy rainfall and numerous Flood Advisories issued (over 150), there was little large-scale flood activity during the month. The U.S. Virgin Islands were relatively tranquil, with near normal rainfall at St. Thomas. No tropical storms or hurricanes affected the region during the month.

The month began with an active tropical wave moving across the Virgin Islands and Puerto Rico on the 1st, helping to produce scattered to numerous showers and a few thunderstorms across the islands. Urban and Small Stream Flood Advisories were posted for Bayamon, Dorado and Toa Baja just west of San Juan and for several municipalities in the northwest, primarily in the Rio Culebrinas basin. Rainfall of 2 to 3 inches was estimated by Doppler radar in a few hours as the storms moved through. The maximum gage amounts were at Moca (MOCP4), 1.92"; Utuado (UTKP4), 1.62"; Aguada (AGDP4), 1.60"; Lares (LARP4), 1.54" and at San Juan WSFO (JSJ), 1.49". A similar pattern developed on the 2nd, with very strong storms developing over portions of the far west, and producing copious rainfall. Eight counties were under Urban/Small Stream Advisories during the afternoon, with WSR-88D radar estimating 2 to 3 inches over several municipalities and isolated amounts up to 5 inches near the coast in Rincon. 24-hour gage rainfall amounts were highest in the more densely gaged eastern part of the island with 1.95" at Rio Cayaguas (SLKP4); 1.82" at Rio Bayamon (BAYP4); 1.80" at Barrio Montones (VAMP4); 1.41" Barrio Marin (PARP4); and Lago Carite (CARP4). Rainfall activity was confined to a small portion of northwest Puerto Rico on the 3rd, although seven additional municipalities were covered by a Flood Advisory, with up to 2.5 inches estimated by radar. July 4th saw the main convection centered over the Rio Guanajibo basin in the southwest, where a Flood Advisory was issued for twelve municipalities after radar estimated up to 3 to 3.5 inches in an hour. The maximum gage totals in the area were 2.33" at Rio Rosario (MAYP4) and 1.73" at Rio Guanajibo at Sabana Grande (ZOBP4). The 5th and 6th were relatively tranquil across the islands as somewhat drier air helped reduce the area of shower

coverage.

A tropical wave crossed the islands on the 7th producing somewhat more numerous showers, primarily across the north and west. Precipitable water increased sharply rising from 1.47" to 2.13" from 00Z to 12Z on the 7th and instability was also relatively high, but rainfall totals were not very impressive, with no locations receiving more than 2 inches. An Urban/Small Stream Flood Advisory was issued for Bayamon and Guaynabo, where isolated 2 to 4 inch rains were estimated on radar. Drier and more stable conditions prevailed for the next several days, with only isolated rainfall across the islands.

The approach and passage of a tropical wave, accompanied by a surge in moisture on the 11th to 12th produced more shower coverage across the islands. Several locations picked up over an inch of rainfall on the 11th, including Rio Canovanas at Campo Rico (CNAP4), 1.54"; San Sebastian (SEBP4), 1.04"; Lago La Plata (NARP4), 1.02" and Moca (MOCP4), 1.01". On the 12th a strong thunderstorm over Arecibo produced locally intense rainfall, estimated at 5 to 6 inches in small area and some flooding. PREMA reported several roads flooded, cars stranded and at least one house flooded which prompted issuance of an Urban/Small Stream Flood Advisory. More showers and a few embedded thunderstorms affected primarily the northeastern sections of Puerto Rico during the afternoon with accumulations of rainfall estimated at up to 5 inches in 24 hours by radar. Thirteen municipalities from Canovanas east through Vieques and Culebra were under an Urban and Small Stream Flood Advisory for this activity by late afternoon, although no reports of significant flooding were reported to the NWS. The maximum 24-hour rain gage totals ending at 12Z on the 13th included 2.32" at Vieques (WVEP4); 2.01" at Cerillos Dam near Ponce (PCEP4); 1.89" at Lares (ZBP4); and 1.77" at Rio Grande (VEDP4). A moist (PW 1.93" to 2.01") and unstable (CAPE – 3726 J/Kg) air mass in place on the 13th set the stage for intense convection that developed in the early afternoon over far western Puerto Rico and spread to portions of the central island. Urban/Small Stream Flood Advisories for six municipalities were issued for rainfall ranging up to 3 inches in several hours. The more intense focus activity was over parts of Sabana Grande and Yauco, where radar and satellite rainfall estimates reached over 4 inches in an hour. This was well verified by the Alert rain gage at Sabana Grande (ZOBP4) which measured 3.78" in one hour ending at 18Z and another 1.57" ending at 19Z. The 3.78" in 1-hour has an approximate 10-year return frequency at this location and duration and the 2-hour total of 5.35" an approximate 20-year return frequency according to NWS Technical Paper 42. Flash Flood Warnings for both municipalities were issued and later for northern Guaynilla and Adjuntas. WSR-88D estimates reached 7 to 8 inches in the hardest hit portions of Yauco. Surprisingly, there was no damage or flooding reported to the NWS. 24-hour totals from gages included 5.94" at Sabana Grande (ZOBP4); 4.33" at Corozal Substation (CRZP4); 3.29" at Aguas Buenas (BZAP4); 3.06" at Adjuntas (ADJP4); and 2.86" at Hormigueros (MAYP4).

Convection was again fairly widespread on the 14th, although rainfall was substantially less intense than the previous day. Still, nine municipalities were covered by Urban/Small Stream Flood Advisories at various times during the mid- and late afternoon. 24-hour rainfall reached 2.38" at Mayaguez (ANAP4) and several stations around Adjuntas picked up 1.5 to nearly 2 inches. Upper-air soundings on the morning of the 15th showed that somewhat drier air moved across the island, with PW dropping to 1.57". Nevertheless, this did not prevent another fairly active day of convection, again primarily focused over the west.

Urban and Small Stream Advisories were sent out for seven municipalities from Aguada south and west to San German. Radar rainfall estimates were generally in the 1 to 3 inch range, while rain gages measured over an inch at only four automated gages in the area.

Following a dry day on the 17th, there was considerable hydrologic activity on the 18th across Puerto Rico, despite a relatively innocuous sounding of 1.63" precipitable water and K-Index of 30. The activity was due primarily to interactions of the sea breeze and streamer activity off of El Yunque. Portions of the western San Juan metro area were put under an Urban and Small Stream Flood Advisory in the early afternoon, which was extended later in the day as the storms remained quasi-stationary. Radar rainfall estimates in portions of Toa Baja, northern Bayamon and southwest Catano reached 8 to 10 inches in less than 6 hours, with a

point maximum of 11.3 inches. This is well in excess of the 100-year return frequency at this duration and location, which is near 7 inches for 6 hours. Reports after the event from PREMA stated that up to 40 homes in the area were flooded, along with significant flooding of roads in and around Sabana Seca, Villa Marisol and Toa Baja. An NWS survey of the area after the event showed that this is a flat, low-lying area with poor drainage. Officials stated that all roads in the area were flooded and home flooding was caused by the intense rains that overwhelmed the inadequate local drainage system. Figure 1 shows the WSR-88D radar estimates for the 24-hours ending 12Z on the 19th, but nearly all the rain fell in 6 hours or less. No rain gages were available in this area to corroborate the radar estimates and the NWS Survey revealed no residents with “unofficial” rain gages. Convective activity also developed over the northwest, affecting primarily the Rio Culebrinas and upper Rio Grande de Arecibo basins. Flood Advisories were issued for a number of municipalities in this region, and a Flood Watch issued for the Rio Culebrinas itself. The river rose from near base flow of around 9 feet (80 cfs) and crested at 21.64 feet (9740 cfs; Flood Stage = 24 feet) from 13Z to 18Z. The heaviest rainfall in the Arecibo basin fell above Lago Dos Bocas, preventing rises on the river downstream of this reservoir. 24-hour rainfall ending 12Z on the 19th included 4.22” at Utuado (UTXP4); 3.97” at Barrio Sabana (UTFP4); 3.04” at Lago Caonillas Dam (ARCP4), 2.78” at Moca (MOCP4) and 1.98” at Aguadilla (AGAP4).

Mostly tranquil weather on the 19th and early on the 20th was followed by the approach of a strong tropical wave centered southeast of Puerto Rico. The main convective activity associated with this wave remained south of the island, although Urban and Small Stream Advisories were issued for 15 municipalities in the west and north central parts of the island. Effects from the wave produced showers and a few thunderstorms over the Virgin Islands along with gusty winds (gusts near 50 mph reported) during the afternoon of the 20th. Parts of southeast Puerto Rico were affected on the morning of the 21st, requiring an Urban/Small Stream Flood Advisory for several municipalities. Heavy storms again developed over the western interior around 17Z on the 23rd, with satellite estimates of 3 to 4 inches in several hours. Rio Cerillos above Lago Cerillos (PCEP4) measured 3.26” ending 12Z on the 24th and Barrio Saliente near Jayuya (JAZP4) 2.61”. Activity was much more widespread across the island on the 24th, but the heaviest activity was again centered over the southwest basins of the Rio Guanajibo and Rio Rosario. Hormigueros (MAYP4) had 3.43” and Sabana Grande (ZOBP4) 2.99” for the highest rainfall totals. Flood Advisories for Urban and Small Streams were issued for nine municipalities, but no larger rivers reached Flood Stage. Convection was confined primarily to portions of the southwest and southeast island on the 25th, with again Flood Advisories for a number of municipalities. The 26th was much drier, with only one station reporting over an inch of rainfall; despite this another seven Flood Advisories were issued in the far west and southwest. A mostly dry day on the 27th was followed by more scattered activity on the 28th, with Flood Advisories issued for 10 additional municipalities in the central and interior northwest. Rainfall over the Rio Guajataca basin was sufficient to cause the river at Lares (LARP4) to briefly exceed flood stage, which was the only “official” flood stage exceedance the entire month. The month ended with more scattered convective activity on the 29th over the south and 30th over the northwest, both resulting in Flood Advisories for several municipalities.

Non-Routine Hydrologic Products Issued:

Hydrologic Outlooks (SJUESFSJU):	0
Flood Watches (SJUFFASJU):	2
Flood Warnings (SJUFLWSJU):	0
Flash Flood Warnings (SJUFFWSJU):	4

Urban/Small Stream Flood Advisories: **154**
(SJUFLSSJU)

cc: USGS Caribbean District
USCE Jacksonville Division
SRH Climate, Weather and Water Division
SERFC
NWS Hydrologic Information Center
Southeast Regional Climate Center

Fig. 1 – WSR-88D User Selectable Precipitation showing 24-hour rainfall of over 8 inches and a maxima of 11.3 inches of rain over Toa Baja municipality on July 18, 2004 – ending 1200 UTC, 7/19/2004. Most of the rain fell in 6 hours ending around 2000 UTC.

